



History of Seed Zones

Foresters in the Pacific Northwest gained an appreciation of the importance of seed source as a result of large scale tree planting following major fires in the 1920s, 30s, and 40s. Seed source was often ignored at that time, and there are now numerous examples around the region of plantations where survival and growth are less than optimum because they were established with a poor seed source. In some cases these problems, although they turned out to be very serious, did not become evident until decades after the sites were planted.

Knowing the origin of seed is crucial to determining where it will survive and grow successfully. By the early 1960s a system was established in Washington that made it possible to certify that seed had been obtained from a particular stand. The system was used by the Northwest Forest Tree Seed Certification Association and administered by the Crop Improvement Association, Washington State University Extension Service. In 1966, a statewide seed zone map was developed by local groups knowledgeable in topography, weather, climate, and tree growth. This map was based primarily upon knowledge of Douglas-fir, but was intended for use with all tree species. The map was revised in July 1973. (*See historic seed zone map on next page.*)

The differences we see among trees are determined in part by genetic differences and in part by environmental influences. Native conifers of the Pacific Northwest have the highest levels of genetic variation found in plants (Hamrick *et. al.* 1992). Forest tree species in this region exhibit large genetic differences in survival, growth rate, frost hardiness and other important traits. Some of these genetic differences exist among populations and some of them exist among individuals within populations. In most cases, genetic differences among populations of a species are the result of adaptation to different environments. For several decades, genetic differences among populations have been recognized as an important consideration when selecting appropriate sources of seed for artificial regeneration programs. The use of seed zones is based on the assumption that the local population, which is the result of thousands of years of natural selection, is best adapted to the site.

The range of each species includes an array of environmental conditions. Within that range there are distinctive habitats for which certain trees within that species are better suited. Tree seed zones divide the range of a species up into areas where the habitats are fairly similar. The size and shape of these zones varies depending upon the environment, the species, and its pattern of genetic variation.

The size of a tree seed zone can range from just a few thousand acres in the mountains of the western United States to many thousands of square miles in the gentle topography of the southeastern United States. This is because the environment varies significantly over short distances in mountainous terrain, but only over long distances in some flatter areas.

The size of tree seed zones is also affected by differences among species. For example, Rehfeldt (1993) found that differences in the length of the frost-free period were especially important in determining how genetic differences

would develop among populations and how far their seed could be moved. For Douglas-fir, a difference of more than 18 days in the length of the mean frost-free period between populations meant they were genetically different and seed should not be exchanged. For ponderosa pine, the interval required to delineate population differences was 38 days, while it was 54 days for western redcedar, and more than 90 days for western white pine.